STaRS

Selective TArtrate Removal System

An Energy Saver for the Wine Industry

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WineSECRETS

Winesecrets' Partnership Technology: STARS

The CEC is helping to make this exciting technology is the latest tool available to North American winemakers.

- Selective Tartrate Removal System allows a winemaker to remove the salts that cause tartrate crystal precipitation without extensive, expensive refrigeration.
- A new derivative technology, the Wine pH Adjustment Module, allows winemakers to reduce the pH of wine or grape juice without use of chemical additives such as acid, and offers a quality alternative to sulfur for the preservation of grape juices.

The Benefits of STARS

When used for tartrate stabilization, Winesecrets' electrodialysis technology:

- Saves Energy:

  Energy consumption reduced by up to 95%.

- Saves Wine:

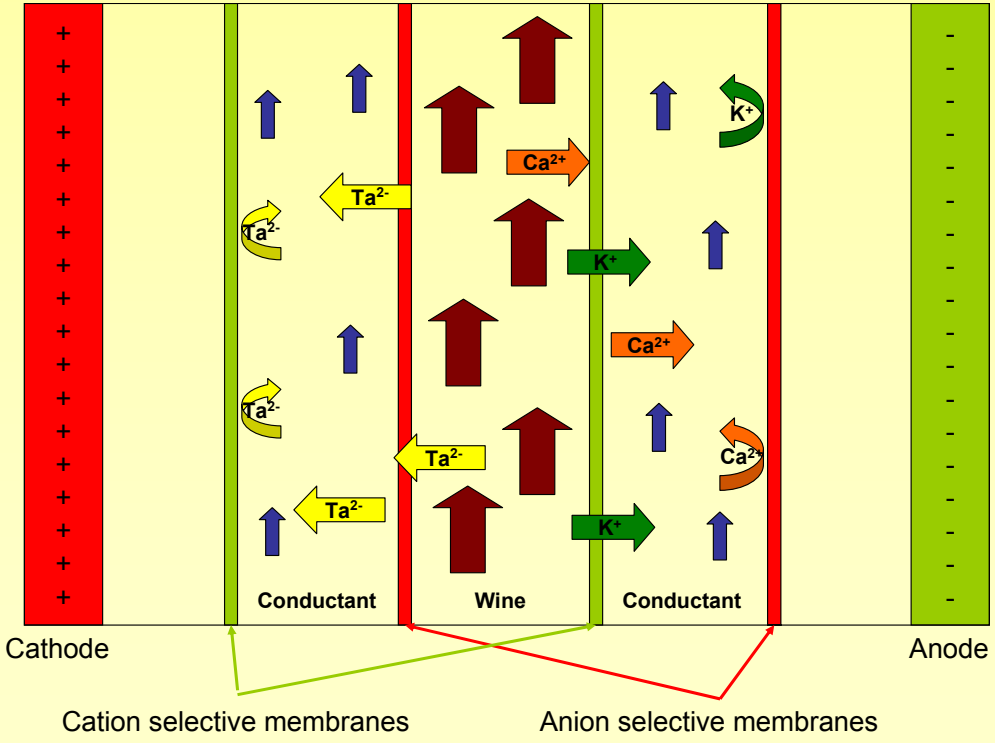
  No loss of wine or flavor, wine quality is preserved.

- Saves Time:

  The automatic, single-pass process, ensures complete stability of all wine processed.

What Makes it Work? Electrodialysis

Weak, electromagnetic attraction and specifically permeable membranes separate ionized compounds (i.e. salts, acids, bases) from weakly charged macromolecules in a solution.

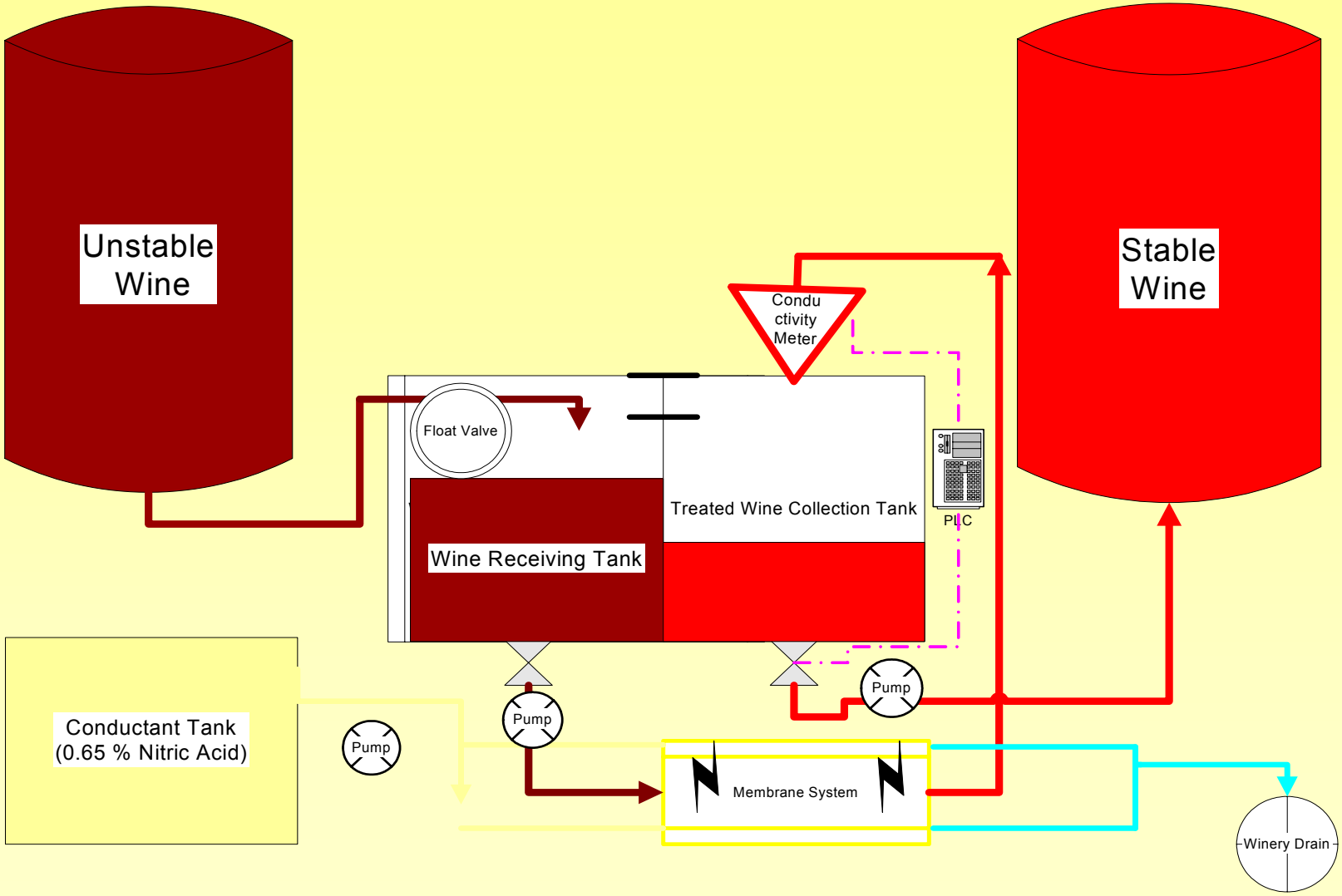


The STARS Process…

Continuous operation, controlled by reduction of conductivity from removal of potassium and calcium tartrate species.

- Analyze wine to determine reduction of conductivity required for stability (tartrate stability point).
- Pass wine between the membranes to reduce conductivity by removing tartrates.
- Monitor conductivity to ensure degree of tartrate removal has been achieved.

Schematic diagram



STARS Units: Winesecrets' mobile unit

Remy Pannier's stationary unit in Saumur, France

This is a foreground view of the 9,000 liter (2,400 gallon per hour system installed in 2000. This system is used for white, blush, sparkling, and red wine.

Stationary unit in Germany

This is a view of a 9,000 liter per hour system installed in June, 2004. While this system does not do pH adjustment, the new-generation systems may be equipped to perform both functions. (note the membrane stacks) New generation plants feature automatic CIP cycle.

Economic Benefits of STARS

Winesecrets cost-engineering research shows that the cost of cold stabilization averages $ 0.01 to $ 0.05 per liter (US). STARS costs are $ 0.008 to $ 0.02 per liter.

STARS Return on Investment at today's energy rates range from 1 to 4 years, depending on the facility's production volume. The savings are the result of:

- Conservation of electricity and natural gas.
- Decreased wear and maintenance of the refrigeration system.
- Reduction of wine loss.

One additional economic benefit that the reduction in the time to market, especially for non-structured whites and roses can improve cash flow considerably.

THE ADOPTION OF THIS TECHNOLOGY BY THE 10 LARGEST WINERIES WOULD CONSERVE ENOUGH ENERGY TO POWER OVER 9,000 HOMES!

Accomplishments of the Project

- Implementation of a mobile STARS unit used to demonstrate the technology to California's wineries, and allow the winemakers to compare the relative quality.
- Development of cost engineering for the process of cold stabilization, and a cost-benefit analysis to compare this process with STARS
- Preparation of a detailed technical report (in English) on the energy savings and wine-making advantages of this technology.
- At least 4 major wine producers are considering the adoption of this technology at this time.

What is next for STARS ?

- Winesecrets continues to work with the California Energy Commission to demonstrate STARS to California's wine industry. Adoption of this system by the 30 largest wineries would save enough energy for a small town.
- Winesecrets is close to installing the first stationary system in the US.
- Data collected from conductant recycling experiment should ultimately enable water consumption of 3-4% of wine volume.
- More operational experience, formal analysis, and sensory data.

The Benefits of pH Adjustment

When used as a replacement for ion exchange, Winesecrets' pH adjustment technology:

- Saves Water:

  Water use is reduced.

- Saves Wine:

  No loss of wine or flavor, wine quality is preserved.

- Saves The Environment:

  Salt load of effluent is reduced considerably over ion-exchange recharge.

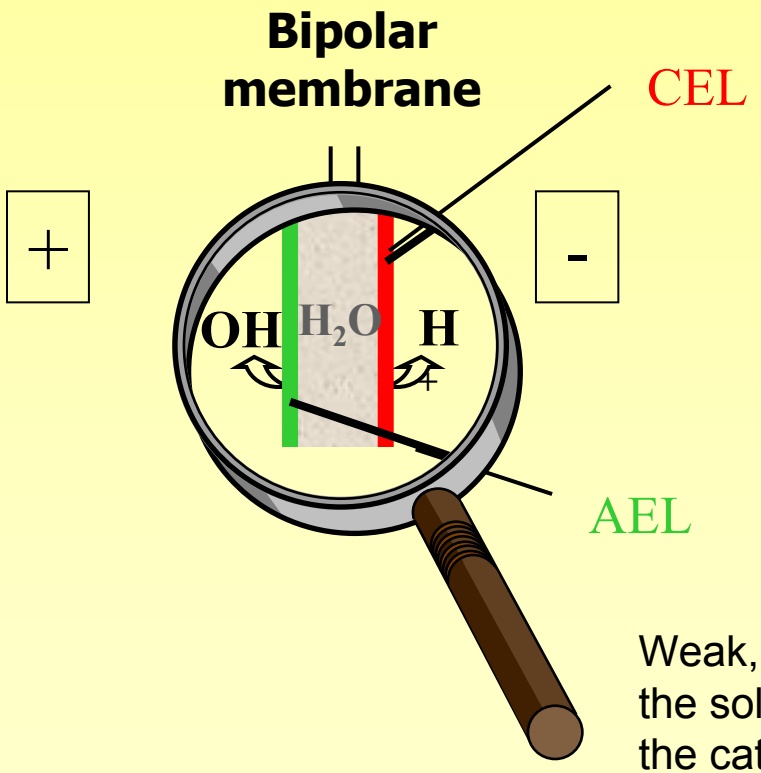
How does pH Adjustment work ?

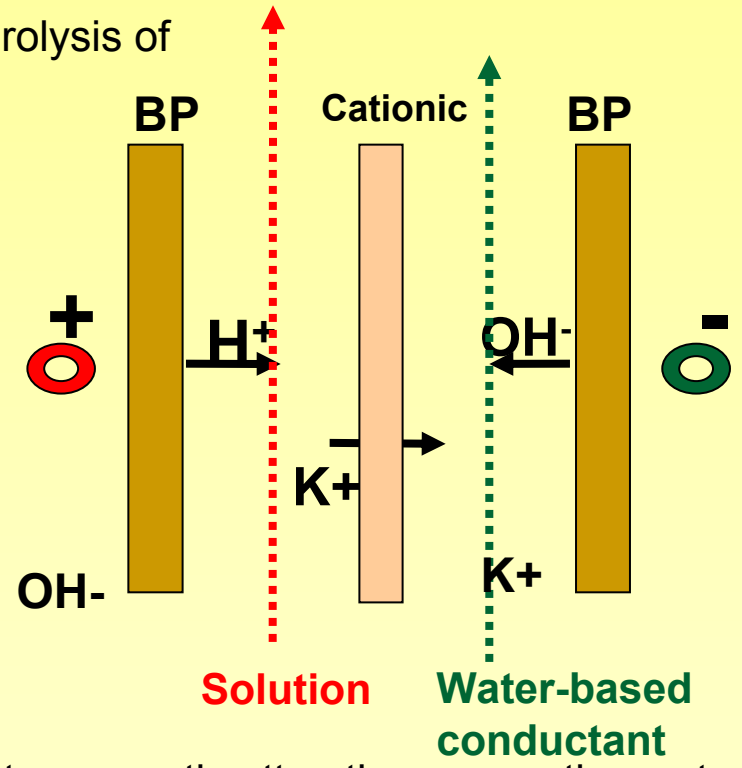
Continuous operation, controlled by reduction of pH from proton addition.

- Pass wine between the membrane to remove potassium. Bipolar membrane operates concurrently.
- Result : Acidification as protons move in to replace potassium
- Monitor pH to ensure that the desired level of pH reduction has been achieved.

Bipolar Electrodialysis: pH Adjustment Module

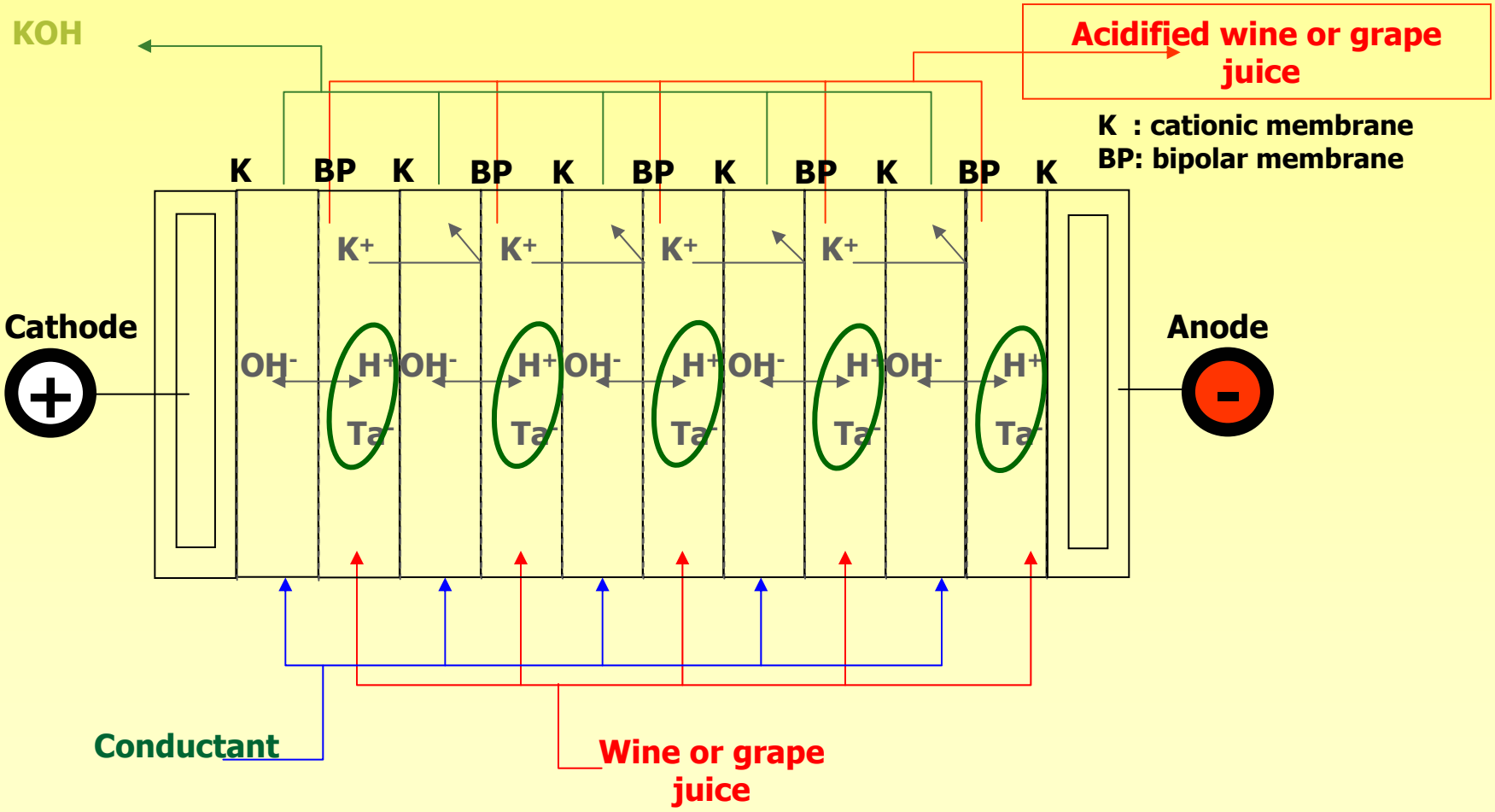
The bipolar membrane acts as a site for hydrolysis of water





Weak, electromagnetic attraction moves the proton into the solution to be acidified, as the same attraction draws the cation through the cationic membrane into the conductant

Schematic diagram



Wine Quality Benefits, pH Adjustment Module

- Only potassium is removed.
- Treatment does not alter color or macromolecular structure.
- No temperature change, additives, or additional filtration required to finish the wine.
- pH adjustment may be performed on components.
- The quantitative differences revealed by chemical analysis are limited to a change in pH. The concentrations of analytes in wine stabilized with STARS tend to be closer to those in unstable wine.
- Feasibility and consistency of the process achieved with juices, musts, white, red, and rosés wines.
- Wine made from juice treated with the pH Adjustment Module compared favorably with wine made from juice acidicified by food acids.
- No negative differences in sensory tests !